ENGINE COUPLED PUMP WITH 90 DEGREE GEARBOX

TECHNICAL FIELD

The invention pertains to pumps and more particularly to a compact, self-powered pump for marine environments.

BACKGROUND ART

A fire on board a ship, particularly a ship at sea, is a serious threat to life and property. Because an onboard fire is capable of disrupting the ship's firefighting, pumping, cooling and electrical systems, there exists a need for a self-powered pump which is adapted to draw water from the sea, sometimes from about 7 metres below, to put out the fire. The requirement also exists for such pumps which are portable in the sense that they may be moved by manpower from place to place aboard the ship. Accordingly, such pumps must be compact and light-weight. Such pumps may be powered by petrol engines but diesel is the preferred fuel for safety reasons. Previous attempts to provide diesel powered pumps which comply with various maritime and naval regulations have been largely unsuccessful. Diesel motors are generally bulky and heavy. Accordingly, these various requirements for power, compactness, weight, reliability in marine environments and versatility have provided the motivation for the present invention.

It is noted that the type of pump provided by the present invention is equally adaptable to fighting fires on board ships, pumping water from flooded compartments aboard ships, providing auxiliary cooling water to a ship's equipment and fighting fires in remote and rural environments for example by pumping water from residential swimming pools or other water sources as required and without the need for external power.

SUMMARY DISCLOSURE OF THE INVENTION

Accordingly, there is provided a self powered pump comprising a frame which supports a mounting plate. Vibration isolating mounts separate the plate from the frame. A marine grade, water cooled diesel engine is mounted above the plate so that its primary axis of rotation is vertical. A 90 degree gear box is mounted below the plate and is driven by the diesel motor. An output shaft of the 90 degree gear box drives a centrifugal water pump whose axis of rotation is horizontal.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

In order that the invention may be better understood, reference is now made to the accompanying drawings in which:

Figure 1 is a side elevation, partially cross-sectioned illustrating a self contained pump according to the teachings of the present invention;

Figure 2 is a top plan view of the frame of the device depicted in figure 1;

Figure 3 is a front elevation of the frame and vibration mounted instrument panel of the device depicted in figure 1;

Figure 4 is a perspective view of the device depicted in figure 1;

Figure 5 is a top plan view of the mounting plate depicted in figure 4;

Figure 6 is a perspective view of the underside of the plate depicted in figure 5;

Figure 7 is a perspective view of the removable oil sump;

Figure 8 is a cross sectional view of the 90 degree gear box and centrifugal pump of the present invention.

BEST MODE AND OTHER EMBODIMENTS OF THE PRESENT INVENTION

As shown in figure 1, a portable and self-contained pump for marine and other environments comprises a rigid aluminium frame 10 which supports a water cooled thirty horse power, marine grade, diesel engine 11. The diesel engine 11 is affixed to a mounting plate 12 which is supported by vibration isolating mounts 13 above risers 14 which are affixed to the lower side rails 15 of the frame 10.

An "L" drive or 90 degree gear box is mounted to the plate 12 and below it. The gear box 16 is driven by the diesel motor 11 and in turn drives a centrifugal pump 17.

In preferred embodiments, the diesel motor 11 is a YANMAR model P36 and the pump 17 is a Waterous™ model CP2.

As shown in figure 2, the aluminium chassis or frame 10 comprises parallel horizontal side rails 15 and rearwardly inclined uprights 18 which are attached to the side rails 15 and reinforced with gussets 18a.

Beneath each of the side rails 15 there is mounted an elongated stabilizing rail 19 which can optionally have vibration isolating features. Each of the two rails 19 (as shown in figures 1 and 3) consist of an upper Teflon® element 20 and an optional lower rubber element 21. In operation, the unit bears its entire weight on the pair of Teflon and rubber assemblies 19, which are particularly adapted to absorb vibrations which may originate from underwater explosions as well as stabilizing the position of the unit during operation.

As shown in figures 1 and 2, the horizontal side rails 15 also support, toward their back end, and behind the assemblies 19, a pair of wheels 22. The lower most point of each wheel 22 is above the bottom surface 23 of the assembly 19 so that when at rest, the wheels 22 do not touch the ground. However, upon elevating the front 24 of the unit, the

wheels 22 make contact with the deck or ground so that the unit may be wheeled by a single individual. In preferred embodiments, the wheels are mounted between or in-board of the side rails 15 as show in figure 2.

As shown in figure 3, the rearward sloping uprights 18 support between them, a vibration isolated instrument panel 30. The vibration isolation of the panel 30 further protects the instruments 31 from vibration stemming from the motor 11 or external vibrations. One or more openings 32 in the front surface of the unit below the instrument panel 30 provide access to the motor and other components contained within the frame. It will be appreciated that the unit may be provided with an outer casing or exterior cover panels, as required.

As shown in figure 4, it can be seen that the motor 11 is further stabilised by a pair of arms 41 which extend from the inclined uprights 18 to engine mounting bolts 42. It can also be seen that the mounting plate 12 includes a rear facing cut out portion 43 located between the rear mounting holes 44 which cut out portion serves to compactly accommodate the casing of the centrifugal pump 17. The motor also is provided with a mounting bracket 45 which is located below the fly wheel 46 the mounting bracket 45 is adapted to retain a hand wound, spring powered starter motor which is adapted to engage the ring gear and provide enough power to start the engine when manual starting is required.

As shown in figure 5 the integral mounting plate 12 is fabricated from marine grade aluminium. It includes rearward mounting holes 44 and forward mounting holes 47 each of which is adapted to allow the plate to be coupled to vibration isolating mounts 13. The upper surface of the plate 12 includes a central portion of increased thickness 48. This portion 48 contains the holes which are required to mount the motor 11 as well as the required openings for the drive shaft, exhaust water and oil fittings which the motor requires. As shown in figure 5, the area of enlarged thickness 48 includes an "L" shaped grove or channel which serves as a gallery for collecting engine oil to accumulate. Because the plate 12 is fabricated from aluminium and because it is somewhat thicker than it need be for purely structural reasons, it acts as a heat sink and radiator for the engine and enhances the ability of the unit to remain at the correct temperature during emergency or firefighting operations. Cooling is further accomplished by taping the output 49 of the pump 17 thus allowing a fraction of the pump's output to be directed into the cooling jacket of the motor 11.

As shown in figure 6, the underside of the plate 12 is provided with cooling water input and output nipples 50 which are threaded or set into oversized openings and are therefore able to accommodate the unusually high pressure (150 psi rather than 50 psi) delivered by the output of the centrifugal pump 17. Internally of the motor, the thermostat galleries are enlarged as well. The underside of the plate 12 is provided with a down pipe 51 for drawing lubricating oil from the sump. The underside of the plate 12 also supports an exhaust pipe 52 and includes an opening 53 for the drive shaft.

As shown in figure 7, an "L" shaped oil sump 70 is provided. The upper surface 71 of the sump includes access holes 72 for admitting engine oil and discharging sump oil as well as mounting holes for receiving fasteners 73 which extend through the mounting plate 12. The shape of the sump 71 provides additional surface area for cooling, volume and ease of removal and compactness as it is able to fit around the exhaust.

As shown in figure 8, the "L" drive or 90 degree gear box 16 includes a main casing 80 which supports a portion of the shaft 81 which extends between the gear box 16 and the centrifugal pump 17. The "L" drive is of the step-up type, taking the output of the motor at about 4300 rpm and delivering a 6000 rpm output to the pump. One end of the shaft 81 supports a spiral bevel gear 82 which is driven by a corresponding spiral bevel drive gear 83 which is carried by the shaft 84 that extends between the motor 11 and the gear box 16. The gear box end of the shaft 81, via the hub of the spiral bevel gear 82, is also supported by a tapered roller bearing 85. The main housing 80 has affixed to it a mounting plate 86 which includes a well 87 for receiving a vertical thrust bearing 88. The well 87 also retains a radial thrust bearing 89. The axial thrust bearing 88 supports a thrust collar 90 which is integral with the shaft 84. The well 87 also includes an upper extremity 91 which may support seals between the motor and gear box as required. The main case 80 of the gear box 16 also includes an oil outlet opening (not shown) which is located closely adjacent to the area where the spiral bevel gears 82, 83 mesh. The rotation of the bevel gears creates a spray or supply of oil which enters the outlet opening and which may then be delivered to areas of the gear box which require lubrication, namely the thrust bearings which support the shaft 84.

In some embodiments of the invention, used cooling water is injected into the engine's exhaust gases. This creates a cooled exhaust stream which is particularly useful during use of the pump in hot environments such as below the deck of a ship.

While the present invention has been disclosed within relation to particular examples of details and construction, these should not be construed as limitations to the scope or spirit of the invention.